Proceedings of the Fifth International Conference on Computing Methodologies and Communication (ICCMC 2021)
IEEE Xplore Part Number: CFP21K25-ART

Smart Trolley for Smart Shopping with an Advance Billing System using IoT

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2021 5th International Conference on Computing Methodologies and Communication (ICCMC) | 978-1-6654-0360-3/20/$31.00 ©2021 IEEE | DOI: 10.1109/ICCMC51019.2021.9418348

Abstract - **In the current scenario, people are more attracted to buy groceries from Supermarket/Hypermarket. In such a case, finding the essential need of any customer in supermarket consumes more time and after all findings the customer need to wait in the billing queue to complete billing process of the selected product. Currently, due to the covid-19 pandemic, the customers are strictly instructed to maintain social distance but practically it is not possible especially in the billing process. To overcome this significant challenge, this research work proposes a smart trolley based on Internet of Things [IoT] with an advanced billing system that makes shopping easier and secured and also avoids standing in long queue. The proposed system consists of a smart trolley attached with LCD display, barcode scanner and a raspberry-pi. This exploratory model is intended to completely eradicate the tedious shopping interaction and administration-related issues. The proposed framework can be undoubtedly implemented at a business scale under the genuine situation.**

Keywords: IOT, Raspberry-pi, LCD, Barcode

I. INTRODUCTION

With the expanding dependability and cost adequacy of Internet of Things (IoT) [1] associated keen things in the field of shopping applications, it bodes well to guarantee such innovations that are put to use to remove the everyday worries of the average person. In this structure, this research work depicts the execution of a reliable, sensible and savvy Smart Shopping Cart [2]. Such a system is sensible for use in any Brick and Mortar shopping spots, for instance, general stores, where it can help in decreasing work and making a prevalent shopping foundation for its customers. Instead of influencing the customers to hold on in a long queue for taking a gander at their shopped things, the system helps in motorizing the charging method. Close by this limit, the structure configuration furthermore ensures identification of examples of trickery invoked by misleading customers, which influences the sharp system to be sensible and appealing to both the buyers and shippers. The results are enabling and make shopping less requesting and accommodating to the customers. The essential objective of the proposed structure is to give a development masterminded, sharp, ease, versatile and harsh system for an unrivaled in-shop contribution for the forefront world customer.

The splendid shopping basket will be an in all cases shopping basket. It will enable the customer to screen the total expense additionally, when things are added to the shopping cart. The customer will know about his financial plan and the offers that are accessible at the market. It will similarly examine distantly with an in store section to make simple installments in a rush. The customer has a decision to make simple online installments through the application. On account of any unclearness, the client will in like manner have the alternative of going up to the checkout counters [3]. This new structure would reduce the long hold up occasions at the checkout counters, increase the profitability of the checkout technique, and would outfit the client with the current style cost and total data, which makes the whole experience more supportive. This structure tends to one of the normal issues that customers face in the current framework, for example, incapable to find the things in the stock or worker for any assistance. The application will help the customers to find things at the correct stock by giving the data about the things in the rundown alongside a course guide of the grocery store subsequently giving new insight to the customers. This will likewise have the historical backdrop of the things purchased by the customer. This will empower customers to utilize the information for next buy. The general store can comprehend the pattern and subsequently stock the stock or advance offers as needed.

This paper expects to diagram a system which scrutinizes the normalized label on everything that is placed in the shopping basket and updates the thing information which is accessible to the client. Weight/Weight sensors will be used to recognize the proximity of new things in the shopping basket. The normalized identification scanner isolates the standardized label which is sent to the microcontroller through a USB association. The Raspberry - Pi examines information from a SD card installed into the miniature regulator. This SD card has all the information about the thing. This data is then coordinated and shown to the customer for study and affirmation on a LCD screen. New things in the shopping basket will be perceived by following the change in the yield of weight sensors. Comparable sensors will be used to perceive when things are ousted from the shopping basket. A program will be executed to affirm the ejection from the client's shopping bushel.

Another program will be executed to work as an against every framework to hold the client back from leaving without a viable portion. The cart inbuilt customized charging structure makes shopping a breeze and has other positive mood killers, for instance, freeing staff from dreary checkout filtering, reducing a total number of staffs required and extending operational adequacy of the system. In ends, we moreover talk about open entryways for improving the proposed system to influence it into a financially reasonable thing as a wonderful way to deal with assistance customers to diminish the time spent in shopping by showing the summary of things, their expense, the best game plans/rates on the things and modified charging. The structure helps the store organization with a modified revival of the stock on each purchase of a thing. Intelligent shopping Cart (proposed system) can make shopping more pleasurable and powerful for the client and the stock control less requesting for the store organization. Smart shopping bushel (proposed structure) can make shopping more pleasurable and successful for the client and the stock control less requesting for the store organization.

Contribution of this paper is as follows chapter II we discussed various exiting methods related to IOT based smart trolley for supermarkets. Chapter IV demonstrates the implementation of the proposed work. Chapter V describe the results and discussions based on the feedback from the Customer perspective views.

II. LITERATURE REVIEW

Remote procedure and Internet of things, and proposes essential data on Supermarket Shopping Guide System, investigates its development and capacities, and as per Internet of things, understands a run of the mill Internet of things for mechanical undertaking, in this way enormously improving the speed of grocery stores working stream. Improve the productivity, yet additionally lessen human activity mistakes. With the all-inclusive of the framework, a few issues may happen, here we talked about some of them [4].

In this paper [5], the creator gives a viable plan dependent on the everyday grounds store activity and the business tasks of customary general store to accomplish the proficient and inventive grounds store activity. The plan depends on Internet of Things innovation to construct administration stages which incorporates astute shopping streetcar framework, keen store racks framework canny self-gather bureau frameworks to accomplish operational adaptability, operational effectiveness and full-highlighted smart grounds general store

In this framework [6], shrewd shopping baskets that the purchasers can explore as they continue looking for their ideal things are utilized, while special things are additionally suggested, and the charging data will be determined during the client's shopping movement. The savvy shopping basket will naturally distinguish the things put inside and put them on the tab. Utilization of this strategy will permit customers to save time by keeping away from the long queues at the registration focuses, and the management of the general store will be more proficient. The quantity of items will likewise be refreshed and shipped off the primary worker by the sensor on the shopping basket, so the worker will consistently know about the situation with each thing in the store. In addition, the administration of the stock will be significantly more powerful, as the RFID per user will consequently peruse the entirety of the things as opposed to being filtered physically by a representative.

This undertaking executes Artificial Intelligence [7] and the Internet of Things to computerize a grocery store for better productivity. An individual simply needs to stroll in the wake of examining their QR code through the application with their extraordinary ID on it. It will record the client's essence in the shop. The shopping baskets and containers have sensors on them, which can identify the item entering or being taken out. The items are set on racks which have compel sensors to identify if any item is gotten. These racks are shut and they just open with your shopping cards. At the point when you arrive at the counter, you just have to swipe your card again and cash will be deducted from your record as per your buy and a receipt will be given. We anticipate giving this innovation to different grocery store chains in the country and abroad and help them execute it with an ostensible one-time speculation.

In order to deliver an uplifting piece of work [8], the project has been through a range of strategic steps to outline a concise and clear work. Precise approach to the study of each aspect of the project. These components are described below taken from the Guide to Technology Assessment and Commercialization Module, which serves as a guideline. Validate procedures within this system project. Concept Creation and Collection – This is the first part of the project to find an idea that benefits the project. The parameter set for this project. The technique of Double Diamond was used

A standardized and integrated RFID billing system. And the correspondence with ZIGBEE is hired. - of the goods is Supplied with the RFID identifier. Each shopping cart will be introduced with a Product Detection System (PID) containing Microcontroller, LCD, RFID and ZIGBEE units. Purchase Product details can be read on the RFID reader Shopping cart; this detail is submitted to the billing service. The billing system is having a cart Knowledge and EEPROM data, and then access to the data Database of goods and determines the cumulative sum Purchase for O the particular cart. Mainly this device works on overcoming the queue in the store [9].

Zubin Thomas [10] introduced Automated Billing The device using the Li-Fi module would be the most powerful way in order to minimize human effort. LiFi is a wireless mobile phone Networking (re)use of lamps. Light, in particular the emitting diodes (LEDs) are used as visible in LiFi. The light transmitter. They suggested the billing It's done by the Lifi system. Lifi is an expensive thing. Yeah, Mr. P. Chandrasekar, Ms. It's Sangeetha (2014) Proposed an automatic payment system using Raspberry pi and correspondence with ZigBee. Here, any single product of Shopping center, mega markets will be equipped with a shopping mall. The RFID tag is used to classify its type. Each shopping cart is available Planned or executed by a product Kit for recognition.

The shopping market is the place where customers are coming to Buy their products on a daily basis and pay for it. There is a need to measure how many goods are sold and how many are sold. Generate the customer's bill when we're going to Shopping Mart for Shopping, we've got to focus on picking This is the right product. It's also hectic to stand in, after that, Line for the payment of all products. We therefore propose the development of smart electronics. A trolley for the shopping malls that keeps track of the Purchased products and also helps the customer pay for them Bill, with the help of a swiping machine, provided in the trolley.so that the customer can save a little time [11].

III. PROPOSED SYSTEM

The main aim of this proposed methodology is to build a working module of smart trolley that allows the customer to make his/her shopping easy and secure in this pandemic situation, the smart trolley contains of raspberry pi, Lcd touch display, and Barcode Scanner in Fig.1

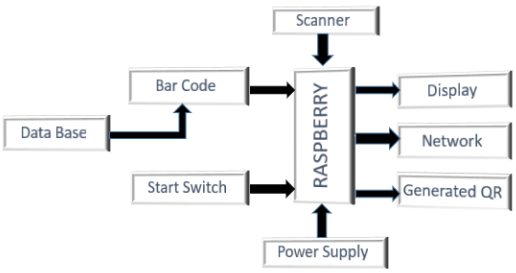

Fig. 1 Block Diagram of proposed model

Workflow Process - Proposed system

Each Shopping Cart is outfitted with a standardized identification scanner, a camera, a weight sensor, a little PC for neighborhood preparation and a presentation gadget (Raspberry-Pi with LCD Screen connected) in Fig.2. The Base Station at a unified area comprises a data set that stores data of the relative multitude of items, and can speak with every one of the Smart Carts through the Wi-Fi organization. At the point when a client begins shopping, she/he needs to login with a Customer ID and connect the Cart ID with the Customer ID, when enrolled; they can examine the items individually with the standardized identification scanner present at the cart and continue to add them to the Trolley.

To deal with every one of the instances of error/deceptive nature, the plan incorporates the utilization of a weight sensor at the truck. Furthermore, cart-to-cart correspondence is empowered that permits the clients to share their shopping list with their accomplice along these lines empowering them to shop in equal without copying their buys. When the client finishes shopping, she/he at that
point continues to the installment counter to cover the bill sum.

Also, the grocery store the board will actually want to dissect the shopping practices of different clients. Primary design of the proposed framework shows up at significant business experiences. These will be very beneficial for the retail locations. By and large, this framework will guarantee that the clients will appreciate the shopping experience and come all the more frequently to shop.

IV. IMPLEMENTATION

In our model we have Raspberry pi that is the core of the framework. It is associated with LCD shows and a standardized tag scanner. A battery is associated with the raspberry pi that assists with running the framework. It has two areas: transmitter segment and collector segments. First introduce the force of the unit then it is prepared to use for the client. On the off chance that the client needs to buy any item, he/she needs to place the item in the streetcar. When the item falls in the streetcar with the assistance of Barcode per user it peruses the Barcode Tag put on the item. This Barcode per user is associated with our Raspberry Pi Kit which will be shown in the touch and checks for the item from the worker. On the off chance that the data gets coordinated, the expense of item, name of item and the complete bill show on the LCD. Assuming the client needs to eliminate any item, he/she just eliminates that item from the touch screen which appears in the LCD showing the name of item, cost of the item and the complete bill. Streetcar is given ESP which has the same capacities as ZIGBEE and ETHERNET. ESP moves the data to the fundamental worker which is in the reach. This principle worker has its own cloud from which the proprietor can get to the data from any place and whenever with the assistance of client ID and secret phrase. This is the idea of the Internet of Things (IOT).

V. RESULTS AND DISCUSSION

From the analytical report generated from the Customers point of view - waiting time in supermarkets, its easily understandable that after the implementation of the proposed system there is a drastic change in wait time for Billing. When compared with the Previous/Existing method it clearly states that the wait time is 2x times greater than the proposed model in fig3.

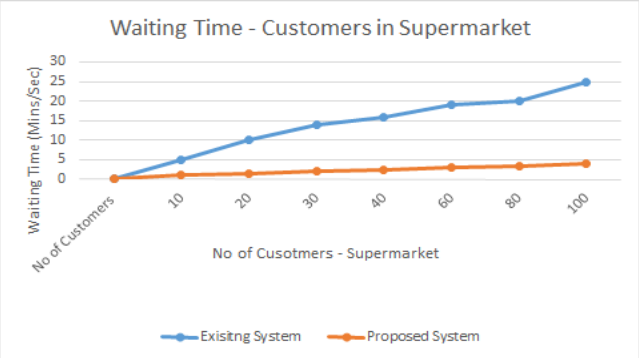

Fig.3 Waiting Time analysis

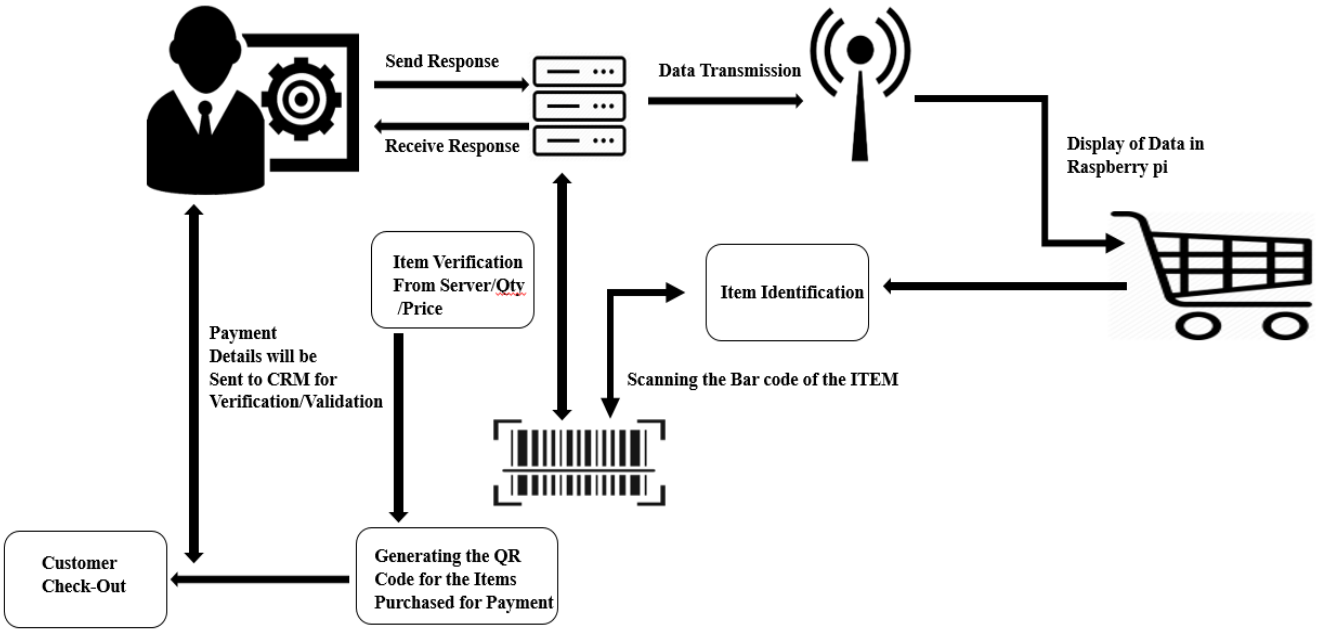

Fig 2. Work flow diagram

The average waiting time per 10 Customer's Ratio there is a differentiation with existing and proposed model is about 4 mins' delay can be avoided in approx.

VI. CONCLUSION

This self-billing device are emerging technology that can provide us many benefits. This can save resources and time. Nowadays all the people are aware of UPI payments and as our system's main method is UPI transaction it will be a lot easier and a lot faster. The utilization of LCD in this cart makes it easy to understand. LCD shows the name of item, cost of item and complete bill. Programmed charging is done in cart so it saves the hour of the client and lessens the surge at the charging counter. It likewise diminishes labor. On account of the utilization of IOT it will likewise accommodate the proprietor. If this prediction becomes a reality, then the company that uses the technology today might gain a competitive advantage in the future.

In future Focus, we planned to upgrade the trolley with dynamic motors that can be attached to the Wheel and generate power and can be backed up to utilize it for the IOT kit attached to the trolley.

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